We Claim:

1. An electro-desorption actuator which comprises:

a fixed member;

a movable member which is coupled to the fixed member;

a pressure chamber which is disposed between the fixed member and the movable member; and

a sorption compression system which is in communication with the pressure chamber and which comprises:

first and second electrical conductors;

a sorbent which is positioned between the first and second conductors;

a sorbate which is capable of combining with the sorbent in an adsorption reaction to form a sorbate/sorbent compound; and

a power supply which is connected to the conductors and which is selectively actuated to generate a current that is conducted through the sorbate/sorbent compound to desorb the sorbate from the sorbent in a desorption reaction;

wherein the sorbate is communicated from the sorption compression system to the pressure chamber during the desorption reaction and from the pressure chamber back to the sorption compression system during the adsorption reaction;

whereby during the desorption reaction a relatively high pressure is created in the pressure chamber which will displace the movable member in one

direction, and during the adsorption reaction a relatively low pressure is created in the pressure chamber which will displace the movable member in the opposite direction.

2. The electro-desorption actuator of claim 1, wherein the desorption reaction is substantially non-thermal.

3. The electro-desorption actuator of claim 1, further comprising a controller for selectively activating the power supply to initiate and terminate each desorption reaction.

4. The electro-desorption actuator of claim 3, further comprising at least one valve for controlling the flow of sorbate between the sorption compression system and the pressure chamber.

5. The electro-desorption actuator of claim 4, wherein the valve is actuated by the controller.

6. The electro-desorption actuator of claim 1, wherein the first and second conductors form an enclosure for the sorbate/sorbent compound which is in communication with the pressure chamber.

7. The electro-desorption actuator of claim 6, wherein:

the sorbent comprises first and second spaced-apart, generally parallel surfaces and a thickness which is transverse to the first and second surfaces; and

the thickness is less than one-half a smallest linear dimension of the surfaces.

8. The electro-desorption actuator of claim 6, wherein the sorbent is attached to at least one of the first and second conductors.

9. The electro-desorption actuator of claim 1, further comprising:

an enclosure which is in communication with the pressure chamber and within which the sorbate/sorbent compound is disposed;

wherein the first and second conductors are positioned within the enclosure.

10. The electro-desorption actuator of claim 9, wherein the sorbent comprises a plurality of elongated monoliths which extend between the first and second conductors.

11. The electro-desorption actuator of claim 1, wherein the sorbate/sorbent compound comprises an impedance which is approximately the same as the impedance of the power supply.

12. The electro-desorption actuator of claim 1, wherein the sorbent comprises a graphitic foam material.

13. The electro-desorption actuator of claim 1, wherein the fixed member comprises a cylinder and the movable member comprises a piston which is slidably disposed within the cylinder.

14. The electro-desorption actuator of claim 13, wherein the sorption compression system comprises an enclosure within which the sorbent is positioned and the enclosure is disposed within the cylinder adjacent the pressure chamber.

15. The electro-desorption actuator of claim 13, wherein the piston is connected to a pusher rod to which an external device is connectable.

16. The electro-desorption actuator of claim 13, wherein the piston comprises a first ring which is magnetically coupled to a second ring that is slidably supported on the cylinder.

17. The electro-desorption actuator of claim 1, further comprising a flexible bladder which is connected between the fixed member and the movable member, wherein the pressure chamber comprises the flexible bladder.

18. The electro-desorption actuator of claim 17, wherein the fixed member is hingedly connected to the movable member.

19. The electro-desorption actuator of claim 1, wherein the sorption compression system comprises an enclosure which includes the first and second electrical conductors and the sorbent.

20. The electro-desorption actuator of claim 19, wherein the sorption compression system comprises at least two enclosures, each of which includes a pair of first and second electrical conductors and a sorbent.

21. The electro-desorption actuator of claim 20, wherein the enclosures are in communication with the pressure chamber.

22. The electro-desorption actuator of claim 20, wherein one of the enclosures is in communication with the pressure chamber and another of the enclosures is in communication with a sealed chamber which is disposed between the fixed member and the movable member opposite the pressure chamber.

23. A electro-desorption actuator which comprises:

a first member;

a second member;

a first chamber which is disposed between the first and second members;

a sorption compression system which comprises:

an enclosure which is in communication with the first chamber and which includes first and second spaced-apart electrical conductors;

a sorbent which is positioned within the enclosure between the first and second conductors;

a sorbate which is capable of combining with the sorbent in an adsorption reaction to form a sorbate/sorbent compound; and

a power supply which is connected to the first and second conductors and which generates an electrical current that is conducted through the sorbate/sorbent compound to desorb the sorbate from the sorbent in a desorption reaction;

wherein the sorbate is communicated from the enclosure to the first chamber during the desorption reaction and from the first chamber back to the enclosure during the adsorption reaction;

whereby during the desorption reaction a relatively high pressure is created in the first chamber which will displace the second member relative to the first member in one direction, and during the adsorption reaction a relatively low

pressure is created in the first chamber which will displace the second member relative to the first member in the opposite direction.

24. The electro-desorption actuator of claim 23, wherein the desorption reaction is substantially non-thermal.

25. The electro-desorption actuator of claim 23, further comprising a controller for selectively activating the power supply to initiate and terminate each desorption reaction.

26. The electro-desorption actuator of claim 25, further comprising at least one valve for controlling the flow of sorbate between the enclosure and the first pressure chamber.

27. The electro-desorption actuator of claim 26, wherein the valve is actuated by the controller.

28. The electro-desorption actuator of claim 23, wherein:

the sorbent comprises first and second spaced-apart, generally parallel surfaces and a thickness which is transverse to the first and second surfaces; and

the thickness is less than one-half a smallest linear dimension of the surfaces.

29. The electro-desorption actuator of claim 28, wherein the sorbent is attached to at least one of the first and second conductors.

30. The electro-desorption actuator of claim 23, wherein the sorbent comprises a plurality of elongated monoliths which extend between the first and second conductors.

31. The electro-desorption actuator of claim 23, wherein the sorbate/sorbent compound comprises an impedance which is approximately the same as the impedance of the power supply.

32. The electro-desorption actuator of claim 23, wherein the sorbent comprises a graphitic foam material.

33. The electro-desorption actuator of claim 23, wherein the first member comprises a cylinder and the second member comprises a piston which is slidably disposed within the cylinder.

34. The electro-desorption actuator of claim 33, wherein the enclosure is disposed within the cylinder adjacent the pressure chamber.

35. The electro-desorption actuator of claim 33, wherein the piston is connected to a pusher rod to which an external device is connectable.

36. The electro-desorption actuator of claim 33, wherein the piston comprises a first ring which is magnetically coupled to a second ring that is slidably supported on the cylinder.

37. The electro-desorption actuator of claim 23, further comprising a flexible bladder which is connected between the first member and the second member, wherein the pressure chamber comprises the flexible bladder.

38. The electro-desorption actuator of claim 37, wherein the fixed member is hingedly connected to the movable member.

39. The electro-desorption actuator of claim 23, wherein the sorption compression system comprises at least two enclosures, each of which includes a pair of first and second electrical conductors and a sorbent.

40. The electro-desorption actuator of claim 39, wherein the enclosures are in communication with the first chamber.

41. The electro-desorption actuator of claim 39, wherein one of the enclosures is in communication with the first chamber and another of the enclosures is in communication with a second chamber which is disposed between the first and second members opposite the first chamber.

42. A method of displacing a first member relative to a second member which comprises:

positioning a pressure chamber between the first and second members;

communicating the pressure chamber with a sorbent;

adsorbing a sorbate onto the sorbent in an adsorption reaction to form a sorbate/sorbent compound; and

generating a current through the sorbate/sorbent compound to desorb the sorbate from the sorbent in a desorption reaction;

wherein the sorbate is communicated from the sorbent to the pressure chamber during the desorption reaction and from the pressure chamber back to the sorbent during the adsorption reaction;

whereby during the desorption reaction a relatively high pressure is created in the pressure chamber which will displace the first member relative to the second member.